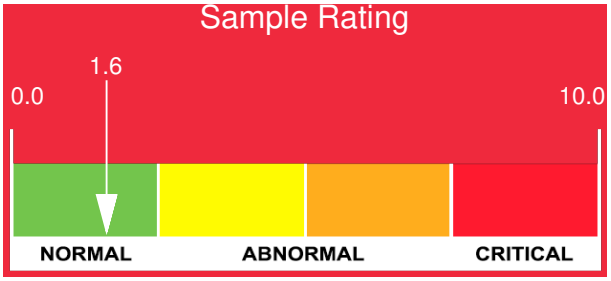
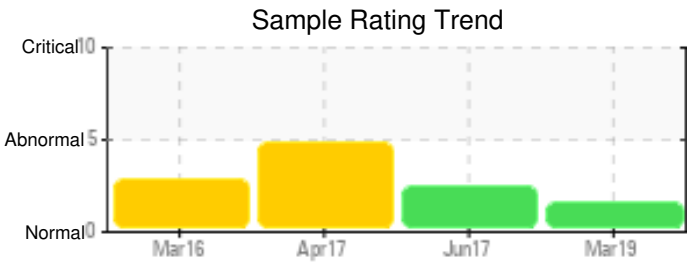




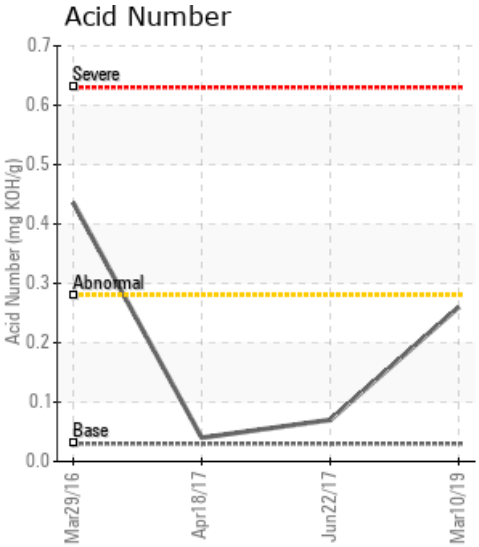
[7-36-58-03W6] H5040 CONDENSATE LINE HEATER

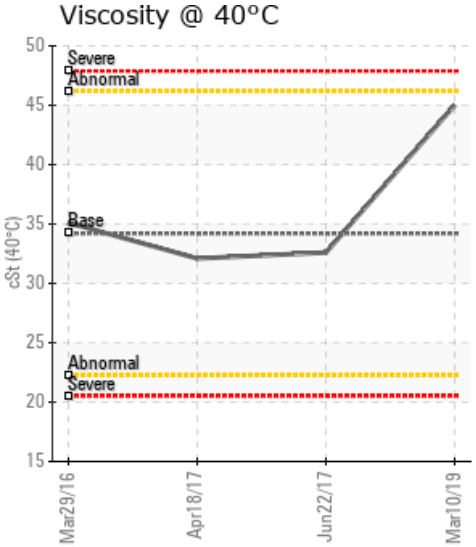
Customer: PTRHTF20103	System Information	Sample Information
CNRL WEST PLANT P.O. BOX 6808 EDSON, AB T7E 1L5 Canada Attn: Rodney Marcichiw Tel: (780)517-3542 E-Mail: rodney.marcichiw@cnrl.com	System Volume: 16000 ltr Bulk Operating Temp: 374F / 190C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: ALCO	Lab No: 02274286 Analyst: Peter Harteveld Sample Date: 03/10/19 Received Date: 03/20/19 Completed: 03/25/19

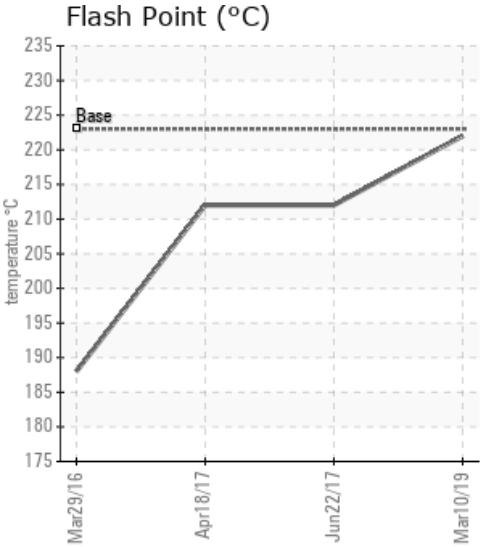
Recommendation: The fluid is in good condition and suitable for further use but the viscosity is slightly high and the solids content is high. Filtration of the fluid is recommended. Please re-sample in 6 months or after filtration has taken place. (whichever comes first)

Comments: Pentane Insolubles levels are severely high.

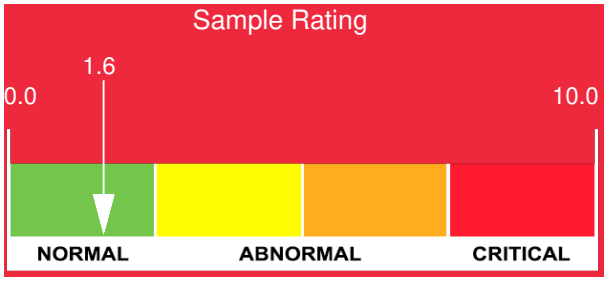
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
03/10/19	03/20/19	10y	BOTTOW OF HEATER	432 / 222	146.3	45.0	0.26	1.80	710 / 376	804 / 429	900 / 482	1.89
06/22/17	07/06/17	0y	BOTTOM OF HEATER	414 / 212	428.7	32.6	0.07	0.180	708 / 376	810 / 432	920 / 494	2.12
04/18/17	04/24/17	0y	BOTTOM OF VESSEL	414 / 212	1893.5	32.1	0.04	0.710	693 / 367	802 / 428	901 / 483	4.13
03/29/16	04/05/16	8y	BOTTOM OF SITE GLASS	370 / 188	51.5	35.1	0.436	0.507	713 / 378	807 / 431	906 / 486	1.42
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

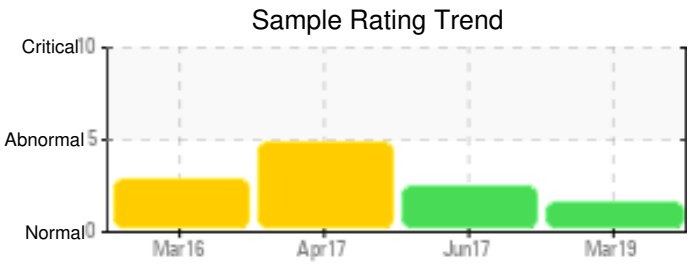






PETRO-CANADA LUBRICANTS

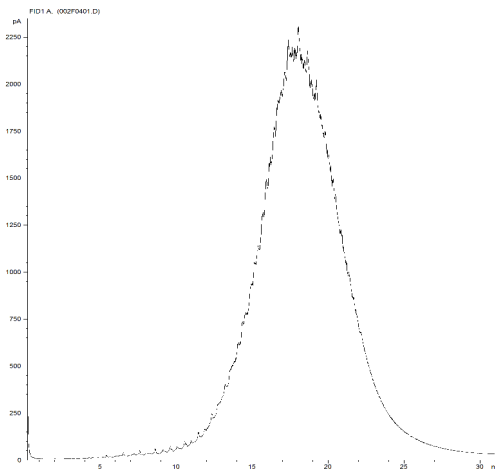


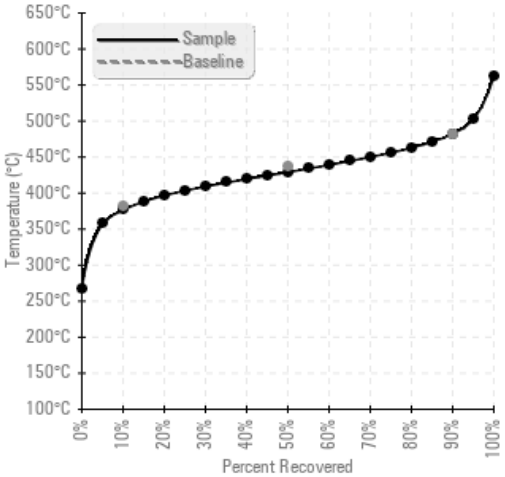


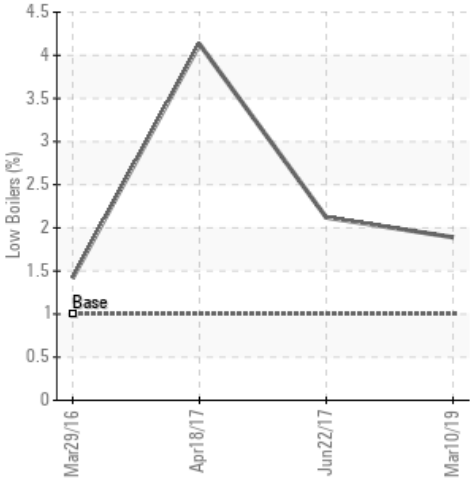
Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
03/10/19	101	0	0	4	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
06/22/17	3	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
04/18/17	35	0	0	0	0	0	0	0	0	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0
03/29/16	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0
Baseline Data			0	0						0			0	0					0				0	

Elemental anaysis results (above) in parts per million (ppm). [10,000 ppm = 1.0%]

GCD Spectrum







Historical Comments

06/22/17	The water content of the fluid has decreased significantly but is still elevated. Venting to atmosphere on a weekly basis will lower this further. The solids content of the fluid has decreased significantly and is now at an acceptable level. The 90% GCD temperature is slightly high indicating some fluid oxidation has taken place. Aside from removing blanket gas during periods of venting, please ensure blanket gas is in place during operation. The fluid is suitable for further use. Please re-sample in 6 months. Water contamination levels are marginally high. Water contamination levels are marginally high.. ppm Water contamination levels are marginally high. (GCD) 90% Distillation Point is marginally high.
04/18/17	Please list service life of the fluid when sending in the next sample.The water content of the fluid is high. This has resulted in an increase in Fe content as a result of corrosion. The percentage boil-off <335C has increased from 1.4 to 4%. This indicates thermal degradation which is supported by a slightly low 10% GCD temperature. It is advised to start venting to atmosphere to boil-off the water and vent off low boiler vapors present as a result of thermal degradation. Pentane Insoluble (solids) content of the fluid increased from 0.5 to 0.7%. This is over the warning limit of 0.5%. The previous recommendation mentioned filtration of the fluid and now it has become more important to start filtration. This to prevent more serious problems from happening as solids content goes up further. (decreased system efficiency, heat exchanger bundle plugging, leaking mechanic al seals of heat medium pumps) Please re-sample in 6 months. Water contamination levels are severely high. Water contamination levels are severely high.. ppm Water contamination levels are severely high. Pentane Insolubles levels are severely high.
03/29/16	The fluid shows indications of thermal degradation but is in good condition and suitable for further use. It is recommended to start venting off low boiler vapors on a monthly basis to keep the Flash Point and percentage boil-off <335C under control.The Pentane Insoluble (Solids) content has reached the warning limit of 0.5%. At this moment it is no problem but fluid filtration should be considered in the near future.Please re-sample in 12 months. Pentane Insolubles levels are abnormally high. Acid Number (AN) is abnormally high. COC Flash Point is marginally low.